

12 **EUROPEAN PATENT APPLICATION**

21 Application number: **85108562.1** 51 Int. CL.4: **A61K 7/16 , A61K 7/20 , A61K 7/30**
22 Date of filing: **10.07.85**

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54 **Cleansing foam for teeth.**

57 The invention relates to a cleansing foam for teeth in aerosol form comprising air, aerating gas and a liquid composition comprising an alcohol component, a pharmaceutically acceptable surfactant, a pharmaceutically acceptable humectant, a pharmaceutically acceptable effective anti-plaque, bacteriostatic agent, and water. The outstanding characteristics of the foam allows the use of it as a denture cleansing foam as well as a toothpaste.

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Cleansing foam for teeth

The invention relates to a cleansing foam for teeth in aerosol form.

Cleansers for natural or artificial teeth have conventionally been available in the form of liquids, powders, pastes or effervescent tablets.

A substantially complete removal of plaque or tobacco-film with a known cleansing means is either not obtainable or requires extensive brushing and/or a considerable period of soaking of the dentures. Furthermore, none of the known cleansing means provides an effective activity against candida species, and/or a really lasting bacteriostatic activity.

The US-PS 45 11 486 discloses a method of cleaning dentures using aerated foams. Although it seems to realise a rapid and effective cleansing, there is no specific improvement in the anti-plaque and/or lasting bacteriostatic activity.

It is known from a number of publications in various journals (Holbeche, J. D., Rulijancich, M. K., Read, P. C., Austral. Dent. J. 20, 397 (1975); Lobene R. R. et al., Pharmacol. and Therapeutics in Dentistry 4, 33 (1969); Llewelyn, J., Br. Dent. J. 148, 103 (1980), Volpe, A. R. et al., J. Dent. Res. suppl. 5, 832 (1969)) that cetyl pyridinium chloride may have some anti-plaque activity but at a rather low level. It especially lacks of equipotency with chlorhexidine.

Furthermore, all the above applications relates to the use of mouthwash containing cetyl pyridinium chloride. No anti-plaque activity is found when cetyl pyridinium chloride is used in lozenges (Barnes, G. P., Radentz, W. H., Perkins, B. E., J. Prev. Dents. 2, 2 (1975)) or in pastes (Rebstein, F., et al., Acta Parodontol. 10, 51 (1981)).

Thus, the problem of the invention is to provide a cleansing foam for teeth effecting a lasting bacteriostatic and effective anti-plaque activity without extensive brushing and/or a considerable period of soaking of the dentures, in case of using the cleansing foam in its most preferable form, namely for artificial teeth.

According to the invention this problem is solved by a cleansing foam of the abovementioned kind which is characterized by a content of the following components: a) an aerating gas and b) a liquid composition comprising an alcohol component, a pharmaceutically acceptable surfactant, a pharmaceutically acceptable humectant, a pharmaceutically acceptable effective anti-plaque, bacteriostatic agent, and water.

Preferred embodiments of the cleansing foam are subject of the respective subclaims.

The invention further relates to the methods of using the cleansing foam as cleansing means for artificial teeth, i.e. dentures, or as cleansing means for natural teeth, i.e. in the kind of a tooth paste.

The cleansing foam according to the invention provides an excellent tobacco film removal of 85 % with a three minute soak or 83 % with brushing of dentures.

The removal of simulated aggressive food stain mordanted onto S. mutans plaque shows, with a three minute soak only, equivalent results to a fifteen minute soak in a commercial two phase denture cleanser.

There is found a reduction from 10^8 to 10^4 of S. mutans on the whole set of teeth using a one minute brush. Moreover the cleansing foam for teeth according to the invention has a lasting bacteriostatic activity which is unique with dentures.

Furthermore it is effective against candida species. No denture cleansing tablet has this activity.

The cleansing foam for teeth according to the invention does not cause any chemical attack or any damage by brushing with it on fine, highly polished acrylic surfaces or on surfaces of natural teeth.

Surprisingly there has been found a very high plaque inhibiting efficacy when using the cleansing foam according to the invention:

75 % inhibition, by weight, of the growth of a S. mutans plaque on paladon acrylic tiles incubated in a high sucrose medium; 54 % inhibition, by weight, of the growth of the plaque cultured from natural mouth flora on paladon acrylic tiles incubated in a high sucrose medium; significant inhibition of natural plaque on real teeth during an eight hour period using human volunteers; and proven inhibition of S. mutans plaque on prosthetic metal, all dental acrylics and silicon denture liners.

All these advantageous effects can be achieved by 0.55 to 0.70 percent by weight of cetyl pyridinium chloride in the above mentioned liquid composition.

The presence of a surfactant in this liquid composition acts to generate the foam and permit penetration of the foam cleanser into the crack and crevices of the teeth, thereby assisting in the removal of stains, debris and food particles from exposed surfaces. Although several commercial available surfactants can be used, a mixture of non-ionic type and an amphoteric type detergent preferred in the present invention whereby the non-

ionic type detergent provides the initial rich foaming characteristic to the product while the amphoteric type detergent provides the second foaming generated during the brushing cycle.

In a particularly preferred embodiment of the invention, the surfactant is a mixture of 6.5 -10.0 percent by weight of the non-ionic type detergent and 4.5 -8.0 percent by weight of the amphoteric type detergent. The employed detergents are cetyl stearyl alcohol ethoxylate (20 moles ethylene oxide) as a non-ionic type detergent and the disodium salt of an dicarboxylic coconut imidazoline derivative as an amphoteric type detergent.

The alcohol component of the said liquid composition, namely ethanol, has several useful purposes. Firstly, ethanol acts together with cetyl pyridinium chloride to provide an effective antimicrobial action. Secondly, the alcohol component solubilizes the flavouring oils and other adjuvants that may not be water soluble. Thirdly, the alcohol component acts together with a flavouring adjuvant to impart a pleasant fresh taste to the cleansed teeth. The ethanol employed in the present invention ranges from 28 -32 percent by volume of the said liquid composition.

The presence of a humectant helps to stabilize the foam. A typical water soluble pharmaceutically acceptable humectant, suitable for use in the said liquid composition is glycerol in an amount of 0.5 - 4.0 percent by weight.

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| L. carvone | 0.375 |
| anethole | 0.375 |
| cinnamaldehyde | 0.264 |
| menthol | 0.149 |
| peppermint oil | 0.171 |
| 3-Hexen - 1 -ol (leaf alcohol) | 0.0225 |
| ethylene brassylate | 0.00045 |
| additional odorants | 0.3997 |

In order to assure a constantly high quality of the product the liquid composition is filled up to 100 percent by weight with demineralized water and the pH-value is adjusted to a range from 8.5 - 7.5 with nitric acid (20 %). Since the cleansing foam for teeth according to the invention has an excellent cleansing effect, a specific anti-plaque,

Since the cleansing foam for teeth according to the invention is to be stored finally in a metallic can, it is useful to add a corrosion inhibitor to the liquid composition. Sodium nitrate or sodium benzoate, single or in combination, is suitable for this purpose when used in an amount from 0 -1.0 percent by weight, preferably less than 0.25 percent by weight, in the case of sodium nitrate or in an amount from 0 -2.0 percent by weight, preferably less than 0.5 percent by weight, in the case of sodium benzoate.

Any colouring and flavouring adjuvants used in cleansing powders or tooth-pastes are also suitable herein. In the preferred embodiment of the present invention a mixture of FD+C Yellow No. 5 in an amount from 0 -0.002 percent by weight and FD+C Green No. 3 in an amount from 0 -0.0002 percent by weight is selected as colouring adjuvant.

A combination of several essential oils is selected to give the product a pleasant very characteristic aromatic odor when used in an amount from 1.0 -2.0 percent by weight, preferably 1.4 -1.9 percent by weight, most preferably 1.80 percent by weight. This special formulation is shown in the following table whereby the specifications are given in percent by weight of the liquid composition relating to the most preferably amount of the flavouring adjuvant:

bacteriostatic activity, a pleasant and fresh colour and flavour and since it is not toxic or aggressive, it can be used as cleansing means for artificial as well as for natural teeth.

Further features and advantages of the invention can be gathered from the following description of a performance example.

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| absolute ethanol | 288 ml (228 g) |
| cetyl stearyl alcohol ethoxylate (20 moles ethylene oxide) | 70 g |
| disodium dicarboxylic coconut imidazoline detergent | 50 g |
| glycerol | 10 g |
| cetyl pyridinium chloride | 6 g |
| sodium nitrate | 5 g |
| sodium benzoate | 10 g |
| flavour blend | 18 g |
| FD&C Green No. 3 | 0.0015 g |
| FD&C Yellow No. 5 (tartrazine) | 0.015 g |
| demineralized water | to 1000 ml (add 563 g) |
| nitric acid (20 %) | sufficient to adjust pH 7.00 |

To the alcohol (288 ml) add the cetyl stearyl alcohol ethoxylate (70 g); disodium dicarboxylic coconut imidazoline (50 g) and the flavour blend - (18 g); mix until the detergents are dispersed. Add water to approx. half of the final volume and mix until the mixture becomes clear. Add glycerol (10 g), add cetyl pyridinium chloride (6 g) and mix until dissolved.

Into a separate vessel mix the colours FD&C Green No. 3 (0.0015 g), FD&C Yellow No. 5 (0.01 g), sodium nitrate (5 g) and sodium benzoate (1 g), add a small amount of water (100 ml) and mix until dissolved. Add to the main mixture and mix until totally dissolved.

Add water to 90 % of final volume (900 ml) adjust pH of mixture to 7.00 using a 10 % nitric acid solution. Make up to 1 litre with water, mix and store.

An aerosol foam composition is:

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| Product | 92 g |
| Dichlorodifluoromethane | 4 g |
| Dichlorotetrafluoroethane | 4 g |

The features disclosed in the foregoing description, in the following claims and/or in the accompanying drawings may, both separately and in any combination thereof, be material for realising the invention in diverse forms thereof.

Claims

1. A cleansing foam for teeth in aerosol form, characterized by a content of the following components: a) an aerating gas and b) a liquid composition comprising an alcohol component, a pharmaceutically acceptable surfactant, a pharmaceutically acceptable humectant, a pharmaceutically acceptable effective anti-plaque, bacteriostatic agent, and water.

2. A cleansing foam according to claim 1, characterized in that the alcohol component is selected from the group consisting of ethanol, isopropanol and mixtures thereof.

3. A cleansing foam according to claim 2, characterized in that the alcohol component is ethanol.

4. A cleansing foam according to claim 2 or 3, characterized in that the concentration of the alcohol component is in the range of 28-32 percent by volume.

5. A cleansing foam according to one of the preceding claims, characterized in that the pharmaceutically acceptable surfactant is a mixture of non-ionic type detergent and an amphoteric type detergent.

6. A cleansing foam according to claim 5, characterized in that the non-ionic type detergent is cetyl stearyl alcohol ethoxylate (20 moles ethylene oxide).

oxide) and the amphoteric type detergent is the disodium salt of an dicarboxylic coconut imidazole derivative.

7. A cleansing foam according to claim 5 or 6, characterized in that the surfactant is a mixture of 6.5 -10.0 percent by weight of the non-ionic type detergent and 4.5 -8.0 percent by weight of the amphoteric type detergent.

8. A cleansing foam according to one of the preceding claims, characterized in that the pharmaceutically acceptable humectant is glycerol.

9. A cleansing foam according to claim 8, characterized in that the concentration of the glycerol is in the range of 0.5 -4.0 percent by weight.

10. A cleansing foam according to one of the preceding claims, characterized in that the effective anti-plaque, bacteriostatic agent is cetyl pyridinium chloride.

11. A cleansing foam according to claim 10, characterized in that the concentration of cetyl pyridinium chloride is in the range of 0.55 -0.70 percent by weight.

12. A cleansing foam according to one of the preceding claims, characterized in that the liquid composition is filled up to 100.00 percent by weight with demineralized water.

13. A cleansing foam according to one of the preceding claims, characterized in that the liquid composition further comprises a corrosion inhibitor.

14. A cleansing foam according to claim 13, characterized in that the corrosion inhibitor is sodium nitrate or sodium benzoate or a mixture thereof.

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| L. carvone | 0.375 |
| anethole | 0.375 |
| cinnamaldehyde | 0.264 |
| menthol | 0.149 |
| peppermint oil | 0.171 |
| 3-Hexen - 1- ol (leaf alcohol) | 0.0225 |
| ethylene brassylate | 0.00045 |
| additional odorants | 0.3997 |

22. A cleansing foam according to one of the preceding claims, characterized in that the pH-value of the liquid composition is adjusted to a range from 6.5 -7.5.

23. A cleansing foam according to claim 22, characterized in that the pH-value is adjusted with nitric acid

24. A cleansing foam according to one of the preceding claims, characterized in that the aerating gas is generated by a propellant.

15. A cleansing foam according to claim 14, characterized in that the concentration of sodium nitrate is between 0.0 and 1.0 percent by weight, preferably less than 0.25 percent by weight, and the concentration of sodium benzoate is between 0.0 and 2.0 percent by weight, preferably less than 0.5 percent by weight.

16. A cleansing foam according to one of the preceding claims, characterized in that the liquid composition further comprises a colouring adjuvant.

17. A cleansing foam according to claim 16, characterized in that the colouring adjuvant is a mixture of FD+C Yellow No. 5 and FD+C Green No. 3.

18. A cleansing foam according to claim 17, characterized in that the concentration of FD+C Yellow No. 5 is in the range of 0.0 -0.002 percent by weight and the concentration of FD+C Green No. 3 is in the range of 0.0 -0.0002 percent by weight.

19. A cleansing foam according to one of the preceding claims, characterized in that the liquid composition further comprises a flavouring adjuvant.

20. A cleansing foam according to claim 19, characterized in that the concentration of the flavouring adjuvant is between 1.0 and 2.0 percent by weight, preferably between 1.4 and 1.9 percent by weight, most preferably 1.80 percent by weight.

21. A cleansing foam according to claim 20, characterized in that the flavouring adjuvant in its most preferably amount has the following formulation (all amounts in percent by weight):

25. A cleansing foam according to claim 24, characterized in that the propellant is a mixture of dichlorodifluoromethane and dichlorotetrafluoroethane.

26. The method of using the cleansing foam according to any of the preceding claims as cleansing means for artificial teeth, e.g. dentures.

27. The method of using the cleansing foam according to any of the claims 1 -25 as cleansing means for natural teeth, i. e. in the kind of a tooth-paste.

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European Patent
Office

EUROPEAN SEARCH REPORT

Application number

EP 85 10 8562

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl. 4) |
| Y | GB-A-1 465 495 (E.R. HOLLOWAY LTD.) * Page 1, left-hand column, lines 9-44; page 1, right-hand column, line 80 - page 2, left-hand column, line 12 * | 1-4, 8, 19, 24, 25, 27 | A 61 K 7/16 A 61 K 7/20 A 61 K 7/30 |
| Y | FR-A-1 145 676 (A. FOLONARI) * Examples 1-4; claim 1 * | 1-4, 8, 19, 24, 25, 27 | |
| Y | US-A-3 822 212 (K.V. BRYANT et al.) * Whole document * | 1-4, 10, 19, 22, 24-27 | |
| Y | US-A-3 639 568 (W.H. SCHMITT) * Example 6 * | 1-4, 10, 19, 22, 24-27 | TECHNICAL FIELDS SEARCHED (Int. Cl. 4) A 61 K |
| Y | DE-A-2 001 317 (H. SCHADE) * Example, page 2 * | 1-4, 8- 10, 12, 13, 19, 24, 27 | |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 18-03-1986 | Examiner FISCHER J.P. |
| CATEGORY OF CITED DOCUMENTS | | | |
| X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document | | T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document | |



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| DOCUMENTS CONSIDERED TO BE RELEVANT | | | Page 2 |
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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl. 4) |
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| A | ER-A-2 361 851 (COLGATE-PALMOLIVE) * Page 8, line 21 - page 16, line 37; example 7 * ----- | 1-27 | |
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| | | | |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 18-03-1986 | Examiner FISCHER J.P. |
| CATEGORY OF CITED DOCUMENTS | | | |
| X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document | | T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document | |